

**What Is Claimed Is:**

1           1.       A method for using empirical measurements of accesses to  
2       synchronization points within an application to construct a performance model for  
3       the application, comprising:  
4           modifying the application to record statistics related to the synchronization  
5       points within the application;  
6           running the application to produce the statistics related to synchronization  
7       points;  
8           constructing the performance model based upon the statistics; and  
9           using the performance model to predict a performance of the application.

1           2.       The method of claim 1,  
2           wherein constructing the performance model based upon the statistics  
3       involves constructing an analytic model for the application; and  
4           wherein using the performance model to predict the performance involves  
5       numerically solving the analytic model to predict the performance for the  
6       application.

1           3.       The method of claim 1,  
2           wherein constructing the performance model based upon the statistics  
3       involves constructing a simulation model for the application; and  
4           wherein using the performance model to predict the performance involves  
5       running the simulation model to predict the performance for the application.

1           4.       The method of claim 1, wherein modifying the application involves  
2 compiling the application with a profiling option in order to record the statistics  
3 related to the synchronization points.

1           5.       The method of claim 1, wherein modifying the application involves  
2 modifying the executable code of the application to record the statistics during  
3 system calls that operate on the synchronization points.

1           6.       The method of claim 1, wherein the statistics include:  
2 an identifier for a calling function;  
3 an identifier for a mutual exclusion variable;  
4 a time spent holding the mutual exclusion variable; and  
5 a frequency of accesses to the mutual exclusion variable.

1           7.       The method of claim 1, wherein the statistics include a directed  
2 call graph specifying an ordering of function calls.

1           8.       The method of claim 7, wherein constructing the performance  
2 model involves constructing a queuing model, wherein each synchronization point  
3 is a service center for jobs representing processes that circulate between service  
4 centers in a manner specified by the directed call graph.

1           9.       A computer-readable storage medium storing instructions that  
2 when executed by a computer cause the computer to perform a method for using  
3 empirical measurements of accesses to synchronization points within an  
4 application to construct a performance model for the application, the method  
5 comprising:

6           modifying the application to record statistics related to the synchronization  
7 points within the application;  
8           running the application to produce the statistics related to synchronization  
9 points;  
10          constructing the performance model based upon the statistics; and  
11          using the performance model to predict a performance of the application.

1           10.    The computer-readable storage medium of claim 9,  
2           wherein constructing the performance model based upon the statistics  
3 involves constructing an analytic model for the application; and  
4           wherein using the performance model to predict the performance involves  
5 numerically solving the analytic model to predict the performance for the  
6 application.

1           11.    The computer-readable storage medium of claim 9,  
2           wherein constructing the performance model based upon the statistics  
3 involves constructing a simulation model for the application; and  
4           wherein using the performance model to predict the performance involves  
5 running the simulation model to predict the performance for the application.

1           12.    The computer-readable storage medium of claim 9, wherein  
2 modifying the application involves compiling the application with a profiling  
3 option in order to record the statistics related to the synchronization points.

1           13.    The computer-readable storage medium of claim 9, wherein  
2 modifying the application involves modifying the executable code of the

3 application to record the statistics during system calls that operate on the  
4 synchronization points.

1 14. The computer-readable storage medium of claim 9, wherein the  
2 statistics include:

3 an identifier for a calling function;  
4 an identifier for a mutual exclusion variable;  
5 a time spent holding the mutual exclusion variable; and  
6 a frequency of accesses to the mutual exclusion variable.

1 15. The computer-readable storage medium of claim 9, wherein the  
2 statistics include a directed call graph specifying an ordering of function calls.

1 16. The computer-readable storage medium of claim 15, wherein  
2 constructing the performance model involves constructing a queuing model,  
3 wherein each synchronization point is a service center for jobs representing  
4 processes that circulate between service centers in a manner specified by the  
5 directed call graph.

1 17. An apparatus for using empirical measurements of accesses to  
2 synchronization points within an application to construct a performance model for  
3 the application, comprising:

4 a modification mechanism that is configured to modify the application to  
5 record statistics related to the synchronization points within the application;  
6 an execution mechanism that is configured to run the application to  
7 produce the statistics related to synchronization points;

8 a performance model construction mechanism that is configured to  
9 construct the performance model based upon the statistics; and  
10 a performance predicting mechanism that is configured to use the  
11 performance model to predict a performance of the application.

1 18. The apparatus of claim 17,  
2 wherein the performance model construction mechanism is configured to  
3 construct an analytic model for the application; and  
4 wherein the performance predicting mechanism is configured to predict  
5 the performance of the application by numerically solving the analytic model.

1 19. The apparatus of claim 17,  
2 wherein the performance model construction mechanism is configured to  
3 construct a simulation model for the application; and  
4 wherein the performance predicting mechanism is configured to predict  
5 the performance of the application by running the simulation model.

1 20. The apparatus of claim 17, wherein the modification mechanism is  
2 configured to compile the application with a profiling option in order to record the  
3 statistics related to the synchronization points.

1 21. The apparatus of claim 17, wherein the modification mechanism is  
2 configured to modify the executable code of the application to record the statistics  
3 during system calls that operate on the synchronization points.

1 22. The apparatus of claim 17, wherein the statistics include:  
2 an identifier for a calling function;

1 an identifier for a mutual exclusion variable;  
2 a time spent holding the mutual exclusion variable; and  
3 a frequency of accesses to the mutual exclusion variable.

1 23. The apparatus of claim 17, wherein the statistics include a directed  
2 call graph specifying an ordering of function calls.

1 24. The apparatus of claim 23, wherein the performance model  
2 construction mechanism is configured to construct a queuing model, wherein each  
3 synchronization point is a service center for jobs representing processes that  
4 circulate between service centers in a manner specified by the directed call graph.  
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